

Human Computer Interaction (HCI) Section

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Overview

Design is the enabler of the digital era. It is a process that creates order out of chaos, that renders technology usable to people. Design means being good, not just looking good. The biggest challenge design faces is not mastering the various technologies, but in introducing meaning and life into products on the human side of the screen -- making the products usable.

People interact with computers by means of a user interface -- the “window” into the computer application. The system may have a myriad of functions, but if the user cannot find them, they cannot use them.

Over time, a discipline that addresses humans using computers has evolved called Human-Computer Interaction, as well as basic principles of interface design and a user-centered process to ensure that people can truly “use” the interface.

What is Human Computer Interaction

Human-Computer Interaction (HCI) is a discipline concerned with what happens when a human uses a computer, and has its roots in Human Factors. Human Factors emerged as a critical discipline during World War II when many pilots and planes were lost due to poor cockpit design. Human Factors focuses on the study of humans -- their environment, their tools – and with special attention on how to increase safety, comfort, and economy while reducing human workload and errors. HCI focuses on humans using computers, and is concerned with the same issues as Human Factors.

Terry Winograd, Professor of Computer Sciences at Stanford University, calls HCI “the kind of discipline that is neither the study of humans, nor the study of technology, but rather the bridging of those two.” This bridge, HCI, is a blending of many disciplines, with the strongest influence from:

- Computer Science
(software development, system architectures, information systems)
- Psychology, Cognitive Psychology, and Sociology
(behavioral and conceptual issues, perception, attention, memory, and problem solving, impact of technology on workplace and society)

- Visual Communications and Design
(communicating information by means of visual elements, combining aesthetic excellence with ease of use)

Undergraduate and advanced degrees in HCI are offered by a number of universities, including Carnegie Mellon, Georgia Tech, and Rice.

The ACM (Association for Computing Machinery), formed more than 50 years ago, is the oldest computer association in the world, with more than 30 special interest groups, or SIGs. One of the largest SIGs is the one for Computer-Human Interaction, SIGCHI. SIGCHI has been in existence more than 25 years, with a global membership including students, teachers, researchers, and practitioners. The annual conference is held in April or May in a different major city in the world. The ACM publishes a periodical dedicated to HCI titled *interactions*, and maintains a digital library on the Internet. (www.acm.org/sigchi)

Evolution of HCI Principles

Prior to the 1980s, the computer technology was limited to character-based interfaces with cryptic textual commands. Computers were the domain of technical people – scientists, engineers, computer programmers and computer operators. Computer interfaces were designed by programmers, who assumed that if they could understand the interface, then anyone else could too. It was necessary for people who used computers in the workplace to receive extensive training in order to use most of the interfaces for the custom-designed applications of that era.

With the advent of the personal computer and the graphical or “WIMP” interface (windows, icons, mouse, and point-and-click), computers made their way onto desktops in the workplace and into people’s homes. Suddenly non-technical people were using applications developed for the masses, with varying degrees of success, depending on how well the interface was designed.

It soon became painfully evident that everyone did not think like programmers, and that user interfaces must be designed for the people who use them. In 1989, the Apple Macintosh became widely popular because of its “friendly, easy to use” interface. Applications developed for the Macintosh were consistent across applications, allowing people to transfer knowledge easily from one application to another.

“Ease of use” does not happen by accident. Apple invested in educating the application developer community by creating the Apple Developer’s University. The introductory course included a video, “The Apple World Builder,” touting the need for a user-centered approach to design and the adherence to the basic principles of HCI. Apple also published the first guide to designing interfaces, the *Apple Human Interface Guidelines*.

Since then other organizations have followed by publishing their own platform specific guidelines:

- IBM – *The CUA Interface Design Guide*

- Microsoft – *The Windows Interface Guidelines for Software Design*
- Apple - *The Macintosh Human Interface Guidelines*

HCI Principles

A good interface makes it easy for users to tell the computer what they want to do, for the computer to request information from the users and for the computer to present understandable information. Clear communication between the user and the computer is the working premise of a well-designed interface.

A video released in 1989, *The Apple World Builder*, presented the original principles of HCI. Some user interface guidelines may use slightly different terminology, but the essence remains the same. The following principles are taken from the video, with the exception of *clear* and *simple*.

Every user interface must be evaluated against these basic principles. Users have come to expect that, minimally, the user interface will adhere to these principles. If it doesn't, they may reject it.

A week's worth of effort on the part of the developer can save the user many years worth of frustration.

Basic HCI principles

HCI PRINCIPLES	Consistency Stability Use of metaphors Aesthetic Integrity Direct Manipulation See & Point Feedback Forgiveness User Control Clear Simple
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Consistency

A consistent interface allows users to apply previously learned knowledge to new tasks. Effective applications are both consistent within themselves and consistent with one another.

All Windows applications use the same quick commands for Cut, Copy and Paste.

Stability

Users expect the interface to remain the same unless they change it.

The application should not close windows automatically to reduce clutter on the screen. The windows belong to the user!

Use of Metaphors

Use real world metaphors allows users to transfer knowledge, thus intuitively understanding the interface.

If the user always uses a weekly calendar starting with Monday to schedule time, provide a calendar starting with Monday in the user interface.

Aesthetic Integrity

Every visual element that appears on the screen potentially competes for the user's attention. Provide an environment that is pleasant to work in and contributes to the user's understanding of the information presented.

Use white space and boxes to group associated data.

Direct Manipulation

Users must see the visible cause-and-effect relationship between the actions they take and the objects on the screen. This allows users to feel that they are in charge of the computer's activities.

In the Date/Time Properties dialog box, you can use the mouse to drag the first and second hands around the clock to set the time rather than having to key in the time via the keyboard.

See and Point

Reduce user cognitive overload. Don't make the user memorize information. Allow the user to choose the information from lists.

Provide a drop-down list of states to choose from when filling in an address instead of requiring the user to remember the two-character abbreviation.

Feedback

Keep the user informed and provide immediate feedback. Also, ensure that feedback is appropriate to the task.

Progress bars are shown in many applications where processing takes more than several seconds.

Forgiveness

Users make mistakes. User actions should be reversible. A good interface facilitates exploration and trial and error learning.

Allow the user multiple levels of "undo" for most actions.

User Control

The user, not the computer, initiates and controls all actions

Modal interfaces are avoided so that the users can change focus and interrupt their current actions

Clear

A clear interface helps prevent user errors, makes important information obvious, and contributes to ease of learning and use.

Use terminology that is familiar to the user.

Simple

The best interface designs are simple. Simple designs are easy to learn and to use and give the interface a consistent look. A good design requires a good balance between maximizing functionality and maintaining simplicity through progressive disclosure of information.

Present the functions that the user uses 80% of the time up front, and bury the functions that are used 20% of the time under menus.